Seasons Lab Instructions

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| **Materials** | **Earth – Sun Model Set-up** |
| * Styrofoam ball * Tape measure or ruler or yardstick * Heat lamp * Lamp stand * Wire * Protractor * Wearable thermometer * Small white sphere * Black Tape * String * White paint marker | Styrofoam spheres are wrapped with black duct tape to enhance light absorption. A wire is run through to sphere (Earth) to represent the Earth’s axis. The North and South Poles are labeled (a white paint marker works best), as well as the Equator. The heat lamp represents the Sun. A small white sphere suspended at the front of the room marks the position of Polaris. Measure 40 cm in front of the heat lamp (toward the front of the room/Polaris) and mark the spot with tape. This spot represents where Earth is relative to the Sun on December 21. The sphere should rest on a beaker/glass jar with as many textbooks as necessary so that the Equator is the same height from the table/counter as the center of the heat lamp bulb. Use a protractor to tilt the axis of the sphere 23-30 degrees in the direction of the small white sphere representing Polaris. No matter where you move the sphere, the axis MUST tilt toward Polaris.  **WARNING: Placing the sphere too close to the heat lamp will result in melting and noxious fumes**. |

Experiment 1: How is Heat Distributed between the Northern and Southern Hemispheres at Different Times of the Year?

1. Measure equal distances (3-6 cm, depending on the size of the sphere) north and south of the Equator and secure the thermometers there with tape.
2. Place your sphere in the December 21 position.
3. Point the heat lamp at the sphere and turn it on.
4. Observe the color changes on the thermometer over the course of 1-3 minutes. Record your observations in your lab notebook and color a diagram showing where the sphere is hottest to coolest. Which hemisphere is experiencing summer?
5. Without breaking any of the “rules” for an accurate Earth-Sun model, rearrange the set-up so that the opposite hemisphere will experience summer. Confirm that the sphere has cooled down to room temperature. Repeat steps 3-4 with the new (but still accurate) model configuration.

Experiment 2: What Would Happen to Heat Distribution if Earth’s Axis Was Not Tilted?

1. Adjust the axis of the sphere so that it is straight up and down.
2. Confirm that the sphere has returned to room temperature.
3. Perform steps 1-5 of **Experiment 1** with the new axis orientation. Is there any difference in heat/light from the lamp between the northern and southern hemispheres? Why or why not?

Experiment 3: Design Your Own Seasons Experiment and Test It!

1. Be sure to write your problem statement, hypothesis, etc. in your lab notebook.